



United States
Department of
Agriculture

Forest
Service

November 2015



Mt. Baker-Snoqualmie National Forest Forest-wide Sustainable Roads Report

Mt. Baker-Snoqualmie National Forest
Washington



For more information, contact:
Mt. Baker-Snoqualmie National Forest
2930 Wetmore Avenue, Suite 3A
Everett, WA 98201
425-783-6000

The U. S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S. W., Washington, D. C. 20250-9410, or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Table of Contents

Executive Summary.....	v
Summary of Issues	v
Summary of Recommended Actions Responding to Issues.....	vi
Analysis Performed.....	vi
Key Results and Findings.....	vii
How the Report Will Be Used.....	vii
Project Introduction.....	vii
Step 1: Setting up the Analysis	9
Purpose.....	9
Project Area and Objectives	9
Roles of Specialists	10
Process Plan	10
Analysis Plan.....	11
Information Needs.....	11
Step 2: Describing the Situation	12
Purpose.....	12
Existing Road System	12
Existing Direction for Roads.....	12
Road Maintenance Levels	13
Step 3: Identifying Issues	15
Purposes	15
Resource Concerns.....	15
Step 4: Assessing Benefits, Problems and Risks	18
Purposes	18
The Analysis Process	18
Rating and Rule-Sets.....	25
Step 5: Describing Opportunities and Priorities	33
Purpose.....	34
Opportunities for Roads	34
Guidelines for Mitigating Road Risks.....	34
Actions that Respond to the Issues.....	36
Step 6: Reporting	39
Purpose.....	39
Desired Condition of the Future Road System.....	39
Key Findings of the Analysis	39
Literature Cited	42

Appendices

Appendix A: Existing System Roads Risk and Benefit Assessment
Appendix B: Definitions for Table in Appendix A
Appendix C: Ecological, Social, and Economic Considerations
Appendix D: Public Involvement and Collaboration
Appendix E: Glossary of Travel Management Terminology
Appendix F: Maps
Appendix G: Financial Analysis
Appendix H: Roads Likely Not Needed

List of Tables

Table 1. Road summary of miles by type for the analysis area	14
Table 2. Resource categories for roads	18
Table 3. Types of Forest Service Access that will be considered in the SRS process.	22
Table 4. Types of Right of Way Access that will be considered in the SRS process.	23
Table 5. Summary of Ratings for Access Needs for Mt. Baker-Snoqualmie National Forest Roads.....	27
Table 6. Summary of Ratings for Resource Risks for Mt. Baker-Snoqualmie National Forest Roads.....	27
Table 7. Priority for Access to Cultural Sites.	28
Table 8. Priority rating based on proximity to stands	29
Table 9. Management consideration for the vegetation management access	30
Table 10. Road Miles Risk Rating by Existing Operational Maintenance Level.	32
Table 11. Road Miles Benefit Rating by Existing Operational Maintenance Level.....	33
Table 12. Potential changes to road system based on Financial Analysis Scenario	40
Table 13. Estimate decommissioning and storage work costs	41

Executive Summary

A sustainable roads analysis is intended to identify opportunities for the National Forest transportation system to meet current and future management objectives, and to provide information that allows integration of ecological, social, and economic concerns into future decisions. To address the requirement by the 2005 Travel Management Rule for a travel analysis and subsequent minimum roads product, the Mt. Baker-Snoqualmie National Forest (MBS) developed a process called the Sustainable Roads Analysis with the end product describing opportunities and priorities that can be used by the responsible official for identification of the forest's sustainable road system following appropriate NEPA analysis. The sustainable roads analysis is tailored to local situations and landscape/site conditions as identified by forest staff members and coupled with ongoing public input.

A review was made of the July 2003 Roads Analysis Report and subsequent Hamilton-Ketcheson road model for the MBS. After considering available resources, it was documented in a charter letter (USDA 2013) that the appropriate scope of analysis was all Forest Service roads within the Mt. Baker-Snoqualmie National Forest Transportation System. On February 13, 2013 the interdisciplinary team (IDT) assigned to this project met to discuss the sustainable roads analysis process.

The outcome of the Sustainable Roads Analysis process is an identification of potential opportunities for changing the way certain parts of the forest transportation system are managed to address administrative and public issues. A thorough analysis supports subsequent National Environmental Policy Act (NEPA) processes, allowing individual projects to be more site-specific and focused, while still addressing cumulative impacts.

As part of this process, the Forest has engaged in a sustainable roads public engagement process to help guide the Forest in a holistic forest-wide approach. The Forest has engaged with the communities we serve in developing a strategy for selecting the roads we keep and maintain. Public meetings were held in communities near the Forest to inform participants on the Travel Management Rule of 2005. The public was asked to tell the Forest which forest roads mattered most to them. The data gathered by the public engagement process was then used to generate geospatial information about public uses and priorities to inform the sustainable roads report. Continued public engagement has included the development of a Sustainable Roads Cadre and a Forest Roads 101 field trip to highlight the primary aspects of forest road management.

Summary of Issues

Issues were identified using public and tribal involvement along with internal Forest Service input.

- Access to recreational sites or opportunities
- Access to timber sales or vegetation management areas
- Legal commitment to others (e.g. easements, special use permits, cost share agreements, road maintenance agreements, private in-holder or mine access, etc.)
- Access for tribes.
- Access to administrative sites (e.g. weather stations and radio repeater sites) and other management areas.
- Aquatic risk
- Wildlife risk
- Protection of heritage or cultural sites

-
- Economic impacts to communities
 - Financial sustainability

Summary of Recommended Actions Responding to Issues

This section summarizes the recommendations developed by resource specialists in Step 5 of this analysis to address the issues identified.

- Focus available maintenance funding and resources on the highest priority roads identified in the SRS report, (address issues related to user safety first, then on repair/prevention of resource issues)
- Focus any available capital funds toward improvement work on high use roads with high environmental risks identified in the SRS report
- Prioritize funding for roads to be closed or decommissioned based on those with the highest environmental risks identified in the SRS report
- Ensure that timber sale purchasers or commercial users perform, or deposit funds, for road maintenance work commensurate with their use
- Seek additional funding for road maintenance through regular appropriations
- Seek new and additional funding sources for road maintenance and improvements through any available funding programs such as Capital Investment Programs, Legacy Roads and Trails, Forest Highway Programs, etc.
- Seek partnership, cooperator, and volunteer opportunities to help leverage funds with outside sources
- Seek opportunities to transfer jurisdiction of FS roads to other agencies
- Continue to look for ways to reduce maintenance costs, and overhead costs related to Forest Service road programs, so as to direct more funds directly to road maintenance and improvement work
- Continue to restrict motorized vehicle use on the forest to a designated road system through travel management.
- Maintain access to recreational sites that are provided by the Forest Service for public use.
- Annually maintain and update the Motor Vehicle Use Map.
- Maintain road signage in accordance with handbook direction.
- Reduce the number of roads located in habitat for species-of-concern and species-of-interest.
- Place seasonal restrictions on roads going through sensitive habitat.
- During the NEPA process for management activities, consider closing open roads in the project area to reduce the maintenance costs.

Analysis Performed

A risk-benefit assessment was used to rank roads based on risks (e.g. wildlife disturbance, impacts on cultural resources) and benefits (e.g. access to facilities, recreational opportunities). Considering public and tribal issues, the IDT identified road risk/benefit issues to be considered. Specialists were then asked to review the questions pertinent to their specialty and use them to build issue statements and evaluation criteria for evaluating the risk or benefit for each road relative to their specialty resource.

Key Results and Findings

Through the sustainable roads analysis process, the IDT ranked routes based on their benefits to recreation use, forest product access, agency and permittee access, and vegetation management, access. Risks to natural and cultural resources were also identified but the IDT determined that they were not a primary driver of how roads on the MBS should be managed for access. Risks will be managed with mitigation and conservation measures during road maintenance activities and site specific NEPA analysis.

- Through the roads analysis process, the IDT does not recommend constructing additional system roads.
- Nearly 41 percent of the MBS road system (2,440 miles) has a resource concern of medium or high. The listing of numerous species as threatened or endangered under the Endangered Species Act and a large amount of unstable landscapes contribute to the high mileage of resource concern roads.
- Identified opportunities where about 32 percent (783 miles) of NFS roads analyzed could be decommissioned, closed, or converted to a trail.
- Identified about 64 percent (1,566 miles) of the current road system could be mitigated by reducing road maintenance levels.

Step 5 of this analysis includes a section on opportunities for making changes to the road system and the map in Appendix F show the opportunities identified by the IDT. A complete list of the individual rankings for each road can be found in Appendix A. A breakdown of miles and percent of miles for the transportation system are shown in the Rating and Rule-Set section of Step 4 (p. 18).

This report documents the science-based travel analysis to be used by the responsible official for identification of the forest's sustainable road system following appropriate NEPA analysis. The IDT has identified a variety of opportunities for making changes to current road management practices that would meet the direction in 36 CFR 212.5(b). The outcomes of this analysis will serve as a basis for long-term maintenance cost reductions, prioritizing the scarce resources to maintaining the desired forest transportation system that meets the access needs for the public or for administrative purposes.

How the Report Will Be Used

The roads analysis process results will assist the Mt. Baker-Snoqualmie National Forest in addressing issues related to roads in the future. It will be used to inform future analyses, decisions, and specific actions (i.e. Access and Travel Management Plans). This analysis is not a National Environmental Policy Act (NEPA) document and therefore does not implement any on the ground activity (i.e. physical road closures or decommissioning).

Project Introduction

Areas that were considered for analysis under the forest-level sustainable roads analysis process included the entire Mt. Baker-Snoqualmie National Forest, totaling about 1.7 million acres. Terrain encompassed by the analysis area is quite varied in respect to slope, aspect, and elevation. All aspects are represented as the landscape is composed of numerous mountains, valleys, and ridges that vary in size. This sustainable roads analysis process analyzed all 2,440 miles of road on the Mt. Baker-Snoqualmie National Forest.

The Mt. Baker-Snoqualmie National Forest will use this sustainable roads analysis report for future projects where the laws, regulations, manual and handbook direction governing the transportation system require that a travel analysis process be completed prior to the NEPA process. This sustainable roads analysis process will assist Forest Line Officers in their proposals and analysis of future projects. Future projects include combinations of vegetation management treatments, including commercial thinning, prescribed burning and both mechanized and non-mechanized fuels treatments that will reduce hazardous fuels, and restoration activities. Additional NEPA projects may include transportation access to mining activities, access to recreation sites and areas, access to authorized users of special use permits including easements.

Step 1: Setting up the Analysis

Purpose

The purpose of this section is to:

- Identify the project area and state objectives
- Clarify the roles of technical specialists
- Develop a process plan and an analysis plan
- Address information needs

Project Area and Objectives

The sustainable roads analysis process will be conducted for all Maintenance Level (ML) 1 to 5 roads on the Mt. Baker-Snoqualmie National Forest. (For additional information on the definition of Forest Service maintenance levels, please see Appendix E, Glossary of Travel Management Terminology). The objective of the analysis is to provide scientific information for managing a transportation system that is safe and responsive to public needs, conforming to the Mt. Baker-Snoqualmie National Forest Land and Resource Management Plan, efficiently administered, in balance with funding available for needed management actions, and has minimal negative ecological effects on the land.

The sustainable roads analysis process is intended to be a broad scale comprehensive look at the transportation network. The main objectives of the sustainable roads analysis process are to:

- Identify opportunities for making changes to the forest transportation system that balance the need for access while minimizing risks by examining important ecological, social, and economic issues related to roads;
- Develop maps, tables, and narratives that display transportation management opportunities and strategies that address current and future access needs, and environmental concerns;
- Identify the need for changes by comparing the current road system and areas to the desired condition;
- Identify opportunities for change that will inform travel management decisions in subsequent NEPA documents; and to
- Provide a list of opportunities and analysis background necessary for the identification of the minimum road system needed for safe and efficient travel and for administration, utilization, and protection of National Forest System (NFS) lands, per 36 CFR 212.5(b)(1).
- Provide a list of opportunities and analysis background necessary for the identification of the roads on lands under Forest Service jurisdiction that are no longer needed to meet forest resource management objectives and therefore should be decommissioned or considered for other uses, per 36 CFR 212.5(b)(2).

The analysis area for this sustainable roads analysis process encompasses all Forest Service roads within the Mt. Baker-Snoqualmie National Forest Transportation. See map in Appendix F.

Roles of Specialists

An IDT of forest specialists were assigned to the sustainable roads analysis process. The team members and their primary analysis role are listed below:

Member	Resource
Felix Nishida	Co-Leader/Transportation
Todd Griffin	Co-Leader/Minerals/Geology
Santino Pascua	Transportation
David Radetich	Data Resources
Loren Everest	Fisheries/Hydrology
Jesse Plumage	Wildlife/Writer/Editor
John Heckman	Fire/Fuels
Shauna Hee	Invasive Plants
Dave Kendrick	Vegetation Management
Dave Redman	Recreation/Scenery
Miki Fugikawa	Lands/Right-of-Ways (ROWs)
Eric Ozog	Special Uses/Lands
Carl Burdick	Heritage Resources
Amy Lieb	Co-Leader/Hydrology/Soils
David Keenum	Geographic Information System (GIS)
Kelly Sprute	Public Affairs/Communication

Process Plan

The sustainable roads analysis process will follow the six-step process described in Forest Service Handbook FSH 7709.55 Chapter 20, Travel Analysis.

The steps are designed to be sequential, with the understanding that the process may require feedback among steps over time as an analysis matures. The process provides a set of possible issues and analysis questions for which the answers can provide recommendations about the management of motorized roads and trails, and the management of motorized areas. This process is not subject to NEPA as it only makes recommendations and not decisions. Further analysis would be necessary to make decisions. The steps in the process are:

- Step 1. Setting up the Analysis
- Step 2. Describing the Situation
- Step 3. Identify Issues
- Step 4. Assessing Benefits, Problems and Risks
- Step 5. Describing Opportunities and Setting Priorities
- Step 6. Reporting

Analysis Plan

The working group followed these steps in order to carry out the analysis:

- Review and assemble existing data.
- Verify accuracy of system road locations on maps.
- Identify and document discrepancies between on-the-ground conditions, the Forest's Infra database, and current management direction.
- Where possible, verify the current conditions of roads and associated features including surface type and impacts on other resources.
- Identify preliminary access and resource issues, concerns, and opportunities.
- Identify road safety issues.
- Identify additional issues, concerns, and opportunities through ongoing public involvement and internal resource staffs.
- Identify opportunities for making changes to the road system based on the findings of this analysis in response to the issues identified.
- Identify past, current and project maintenance costs of road system

Information Needs

The following information was required to proceed with the analysis.

- Accurate location of all system roads within the analysis area. For each road, the following information is needed:
 1. Any existing public, permittee, or agency use.
 2. Any right-of-way dedication to the FS.
 3. Any additional right-of-way required.
 4. Maintenance responsibility for the road.
- Assessment of current opportunities, problems, and risks for all roads in the analysis area.
- Soil, water resources, invasive species, environmental issues, and biological communities.
- Public access and recreational needs and desires in the area, including access for nearby landowners.
- Current observed road uses.
- Current road management objectives.
- Areas of special sensitivity, resource values, or both.
- Best management practices for the area.
- Current forest plan and other management direction for the area.
- Agency objectives and priorities.
- Interrelationship with other governmental jurisdictions for roads.
- State laws that regulate motor vehicle use on and off public roads.
- Applicable federal, state, and local laws.
- Public and user group values and concerns.
- Forest scale and any project level roads analysis process.
- Cultural resources.
- Recent road maintenance costs and budgets

Step 2: Describing the Situation

Purpose

The purpose of this step is to:

- Describe the existing road system
- Describe the existing direction
- Describe road maintenance levels

Existing Road System

Currently the Mt. Baker-Snoqualmie National Forest has an extensive system of roads (2,440 miles) and motorized trails. The motorized trails are not addressed in this sustainable roads analysis process. This sustainable roads analysis process will review and analyze the ML1 through ML5 roads on the Mt. Baker-Snoqualmie National Forest. These roads are shown in Appendix F.

Existing Direction for Roads

A. General

Sustainable roads analysis is focused on identifying needed changes to the forest transportation system; identifying the existing direction is an important first step. The existing direction includes the National Forest System roads currently managed for motor vehicle use. Restrictions, prohibitions, and closures on motor vehicle use are also part of the existing direction. Existing direction from laws and regulations, official directives, forest plans, forest orders, and forest-wide or project-specific roads decisions, determine the motorized routes and areas open to public motorized travel. This information about the managed system is documented in road management objectives, maps, recreation opportunity guides, tabular databases, and other sources.

B. Roads

Open Road

Existing roads open to the public for motorized use are forest system roads, which are currently in the Forest's Infra database (Oracle Database containing information on all roads and improvements on Forest Service lands) with the following attributes:

- System = National Forest System Road
- Jurisdiction = Forest Service
- Route Status = Existing
- Operational Maintenance Level = 2-5

Closed Road

Closed roads have been closed to vehicle traffic for at least a year but are necessary for future activities. They appear in the Forest's Infra database under the following categories:

- System = National Forest System Road
- Jurisdiction = Forest Service
- Route Status = Existing
- Operational Maintenance Level = 1

Decommissioned Road

Decommissioned roads are no longer part of the forest transportation system. They may have some type of physical closure at their entrance (berm, etc.) or may be completely obliterated. They appear in the Forest's Infra database under the following categories:

- System = National Forest System Road
- Jurisdiction = Forest Service
- Route Status = Decommissioned
- Operational Maintenance Level = 1-5¹

In order to return a decommissioned road to service as a system road the NEPA process must be followed even when no physical work is required to allow motorized traffic back on the road

Unauthorized Road

An unauthorized road is a road, which exists on the forest, but is not included in a forest transportation atlas or database. These roads are usually established by various users over time. They were not planned, designed, or constructed by the Forest Service to be used as roads. Currently, these roads are not in the Forest's Infra database, nor are they part of the NFS roads.

C. Motorized Trails

Currently, the designated motorized trails on the Mt. Baker-Snoqualmie National Forest are shown on the 2014 Motor Vehicle Use Map – Mt. Baker-Snoqualmie National Forest.

D. Areas

The Evans Creek Off Road Vehicle Area is one of two designated motorized areas on the Mt. Baker-Snoqualmie National Forest. This analysis does not address motorized use in this Area. That decision was made in the Decision Notice for the Evans Creek Off Road Vehicle Area Plan (2009). The other area is the Mt. Baker National Recreation Area (NRA) which provides snowmobile access in the winter. Snowmobile use in the NRA will not be addressed in this document.

E. Previous Travel Management Planning

The June 2003 Roads Analysis Report and subsequent Hamilton-Ketcheson road model has been used as information by the Mt. Baker-Snoqualmie National Forest Line Officers to add to their understanding of the transportation system on the Forest. Modifications to the transportation system are often made as a result of part of project level NEPA analyses. Designations of roads open to different types of motor vehicles, including off-highway vehicles are made as a result of implementation of 36 CFR 212, Subpart B – Designation of Roads, Trails, and Areas for Motor Vehicle Use.

Road Maintenance Levels

The Forest Service differentiates forest roads into five maintenance levels, which define the level of service, and maintenance required. See Table 1 for the summary of current miles by type for the analysis area. Refer to Appendix E for a more detailed description of the maintenance levels.

¹ The maintenance level of decommissioned roads is the level they were maintained at prior to decommissioning.

Road Maintenance Level 5 (ML5) – roads are managed and maintained for a high degree of user comfort. These roads are generally paved and are suitable for passenger vehicles.

Road Maintenance Level (ML 4) – roads are managed and maintained for a moderate degree of user comfort. These roads are generally paved, but sometimes may be surfaced with stabilized aggregate surfacing and are suitable for passenger vehicles.

Road Maintenance Level (ML3) – roads are managed and maintained for a moderate degree of user comfort. These roads are generally gravel surfaced and are suitable for passenger vehicles.

Road Maintenance Level 2 (ML2) – roads are managed and maintained for use by high-clearance vehicles; passenger car traffic is not a consideration.

Road Maintenance Level 1 (ML1) – roads are kept on the transportation system for intermittent project uses and are closed to vehicular traffic between projects. The closure period must exceed 1 year for the road to be ML 1 status.

Table 1. Road summary of miles by type for the analysis area

Maintenance Level	Miles of Road	Percent of System
1 – Basic Custodial Care (Closed)	639	26
2 – High Clearance Vehicles	769	32
3 – Suitable For Passenger Vehicles	912	37
4 – Moderate Degree of User Comfort	76	3
5 – High Degree of User Comfort	44	2
Totals	2,440	100

A consideration in developing the SRS is road maintenance. Based on funding levels over the previous five years, the Mt. Baker-Snoqualmie National Forest can only afford to maintain approximately 35% of the current road system. This trend is continuing, and by default, annual prioritizing for maintenance has been occurring, resulting in difficulty meeting Highway Safety standards and elevating risk for road failures. The outcomes of this analysis will serve as a basis for long-term maintenance cost reductions, prioritizing the scarce resources to maintaining the desired forest transportation system that meets the access needs for the public or for administrative purposes.

Step 3: Identifying Issues

Purposes

The purpose of this step is to:

- Identify resource concerns
- Identify key issues related to management of existing road system

Resource Concerns

Motor vehicle use on the Mt. Baker-Snoqualmie National Forest has increased in recent years as local and out of area visitation has increased. Increased use has increased the maintenance needs for all road Maintenance Levels (ML). As maintenance costs have increased, allocated maintenance funds have been significantly reduced. This causes a disproportionate shift of maintenance funds to the ML 3-5 roads and as a consequence only a portion of the roads are being maintained on an annual basis. Unmaintained roads are more susceptible to failure and washouts from storms. The increased use coupled with the decreased funds has resulted in degraded soil, water, vegetation, and wildlife habitat conditions.

In some places, decreased maintenance has reduced recreation opportunities by reducing access caused by poor conditions of the road.

Forest roads can alter or modify water (flow) delivery and transport, as well as sediment / bedload delivery, transport, and deposition. Roads can alter aquatic organisms' habitat by affecting habitat access, for example, fish passage. Roads can also influence water quality indicators such as turbidity.

Increased road use coupled with decreased maintenance has resulted in more disturbance or displacement of wildlife, habitat fragmentation, habitat loss, reduction of habitat productivity, and in some cases, wildlife mortality from collisions. In some places, improper user rerouting of eroded road portions, non-compliance with the Motor Vehicle Use Map, and use of ML 1 roads has led to loss or reduced productivity of important wildlife habitats.

Heritage resources are a concern throughout the project area as they are important considerations in all management activities on the Forest. There has been human occupation in the local area for thousands of years. Roads can significantly impact heritage sites.

Motor vehicle use on roads can also facilitate the spread of invasive plants and aquatic species and put floral and faunal diversity at risk.

Key Issues

The key issues were identified through public and tribal involvement and comments that addressed the Mt. Baker-Snoqualmie National Forest road system as well as from input from Forest Service personnel. The following roads issues were identified and are in random order and do not represent a hierarchy of importance.

1) Access to recreation sites or opportunities

The Mt. Baker-Snoqualmie National Forest is one of the most visited recreation areas in the nation. Continued access to high value recreation opportunities and settings is forefront in the mission of the forest. Potentially, there are more than seven million people that depend on the road system to access nine Wilderness Areas, more than fifty campgrounds or picnic areas and 1,500 miles of trail.

2) Access to timber sales or vegetation areas

Vegetation management and silvicultural activities are an important means of accomplishing forest goals and objectives. The Forest uses silvicultural activities to accomplish wildlife habitat objectives, including late successional habitat, big game forage, and riparian habitat treatments and to attain timber harvest goals. Silvicultural activities are commonly accomplished through timber sale and stewardship contracts, which require road access for equipment, vehicle access, and log haul.

3) Legal commitments to others (e.g. easements, special use permits, cost share agreements, road maintenance agreements, in-holder or mine access, etc.)

Many forest users rely on the roads and trail systems to reach destinations or operate their businesses or hobbies, and many of these uses need authorization for the construction, reconstruction, use, and maintenance of roads, trails, and highways across National Forest System (NFS) lands.

4) Access for tribes

The Mt. Baker-Snoqualmie National Forest road system provides access for tribes to exercise rights reserved by treaty to hunt, fish, and gather on traditional lands as well as access for spiritual activities.

5) Access to heritage or cultural sites

There is a need to identify specific road segments that contribute to the Forest's ability to address its inventory, nomination, protection, and preservation responsibilities for federally-owned historic properties.

6) Access to administrative sites (e.g. weather stations and radio repeater sites) and other management areas

There is a need for access for maintenance and repairs to the Forest's communication system to maintain radio communication quantity and quality. Reduced access will transfer risk to aerially delivered maintenance and aviation personnel (increased risk), delay repairs to Forest communication system and reduce radio communication quantity and quality (increased risk). Reduced access will also degrade quality of National Fire Danger Rating System outputs and archived Wx database, as well as increase personnel time and cost to manage and maintain radio and Wx systems.

7) Aquatic risk

Forest roads can alter or modify water (flow) delivery and transport, as well as sediment / bedload delivery, transport, and deposition. Roads can alter aquatic organisms' habitat by affecting habitat access, for example, fish passage. Roads can also influence water quality indicators such as turbidity.

8) Wildlife risk

Roads affect wildlife populations or individuals in numerous ways, from habitat loss and fragmentation, to barriers to animal movement, and wildlife mortality.

9) Protection of heritage or cultural sites

Public access to heritage or cultural sites can result in damage to the properties. The MBS has over 1,000 cultural resources including archaeological and historical districts, objects, structures, buildings, and sites. Impacts may be from mechanical activities, such as road maintenance, or because the road provides access to sensitive resources and contributes to vandalism concerns.

10) Economic impacts to communities

The road system contributes to the economic health of local communities. Forest use is a primary source of revenue for neighboring communities and forest industries that provide local jobs.

11) Financial sustainability

Inadequate maintenance reduces access for National Forest users and management. Funding for road maintenance is not adequate to maintain the existing system and perform needed maintenance. See Appendix G for more on the Financial Analysis including funding expectations and road maintenance costs.

Step 4: Assessing Benefits, Problems and Risks

Purposes

The purposes of Step 4 are to:

- Describe the analysis process
- Describe the criteria used in the risk and benefit analysis process
- Describe the scoring and rating
- Summarize the risk and benefit of existing motorized routes
- Discuss the distribution of risk and benefit assessment

The Analysis Process

The issues described in Step 3 were addressed by the IDT in the following evaluation. The risk and benefit criteria categories (Step 4, Table 2) were developed by considering the issues from Step 3 and the suggested resource questions for roads analysis described in FS-643 Roads Analysis: Informing Decisions about Managing the National Forest Transportation System. The IDT reviewed these resource questions (see Appendix C of this report) and used them to develop criteria to use in ranking the risks and benefits of each road. Each road was then evaluated against the identified risks and benefits.

Table 2. Resource categories for roads

Risk	Benefit
<i>The presence or conditions of motorized use present risks associated with these categories:</i>	<i>Motorized uses benefit Forest management because they provide opportunities for these categories:</i>
Aquatic Resource Concerns	Access for Recreation
Wildlife Resource Concerns	Vegetation Management Access
Botany/Invasive Plant Species Concerns	Access to Cultural/Heritage Sites
Cultural/Heritage Resource Concerns	Forest Service Administrative Access
Economic Impacts to Communities	Access for Special Uses
	Joint Ownership/Use Concerns

Evaluations and Criteria

Roads provide access for many uses. They also provide the infrastructure to facilitate public use, administrative use, and resource management. However, their presence has possible negative effects on the natural and cultural resources of the National Forest. The following categories for risks and benefits were identified by the IDT as the most important resource issues for managing the forest transportation system.

The road risk/benefit issues were identified by the IDT. For each issue, the appropriate specialist was tasked to create criteria by which they would rank the impact of each road segment for that issue. The issue and ranking statements and evaluation criteria were used for the Mt. Baker-Snoqualmie National Forest sustainable roads analysis process. The evaluation was partitioned by the following elements:

- Financial Analyses
- Access Needs

- Resource Risks
- Management Factors

Financial Analyses

Part of the 2005 Travel Management Rule, at 36 CFR 212.5(b)(1), requires each national forest to identify the minimum road system that is needed to:

- Meet resource and other management objectives adopted in the relevant land and resource management plan
- Meet applicable statutory and regulatory requirements
- Reflect long-term funding expectations
- Ensure that the identified system minimizes adverse environmental impacts associated with road construction, reconstruction, decommissioning, and maintenance.

The purpose of the Financial Analysis section of this report is to address bullet number 3 above, and identify opportunities for how the road system could be managed in the future to better reflect long-term funding expectations (Appendix G). This information will be used by the Responsible Official, along with other information regarding the risks and benefits of the road system, to strike the best balance between the four items above. The official decision and “identification” of what will constitute that future road system will be made following subsequent NEPA analyses. In addition to the road-by-road analysis of access and resource risks, our analysis must include a broad-scale (e.g., Forest, District or Zone-wide) evaluation of the general affordability of the road system. The purpose of this analysis is to ensure that the National Forest road system “reflects long-term funding expectations” per the regulations at 36 CFR 212.5. Since this term was not specifically defined in the rule or subsequent Forest Service Policy, the Region has operationally defined it to mean that “average annual funding” is reasonably in balance with the “average annual cost of routine road maintenance.”²

Road Maintenance Costs

The MBS used road maintenance costs to determine the overall cost of the sustainable road system. Annual road maintenance costs were determined for each maintenance level on a cost per mile basis. These costs were determined from past road maintenance contract data. Some assumptions about the type of and number of typical road maintenance activities for each road maintenance level were made. The contract cost data were translated to a cost per mile basis. There may be a range of costs depending upon the availability of other data factors and what may yield the most realistic costs. These factors may include number of lanes, surface type, location, etc. Engineering knowledge and experience about particular roads may also be applied.

Budget Forecasts

The MBS used road maintenance budget forecasts to determine the affordability or size of the overall sustainable road system. The data comes from past road maintenance budgets in WorkPlan and other

² “Average annual funding” is defined as the average amount of funding available for each NFS unit for routine annual maintenance from appropriations, collection accounts, commercial users, cooperators, and other partners during the 2008-2012 timeframe, plus or minus 20%. It does not include funding from the American Recovery and Reinvestment Act of 2009 (ARRA) and Forest Service Capital Investment Program (CIP). Only the modest amounts specified for “routine maintenance” in Legacy Roads and Trails funding allocations are included.

“Average annual cost of routine road maintenance” means the average yearly need for basic road maintenance. This includes log out, drainage maintenance, erosion control, blading, brushing, traffic signs, etc. It does not include cyclical replacement costs (such as bridge replacement every 50 years, asphalt overlays, etc.), which are covered by funding beyond the individual NFS unit budgets (e.g., Regional Capital Investment Program).

sources. Some assumptions about the future trends will need to be made, such as the road maintenance allocation model, fixed costs, continuation of sequestration and the availability of other funding sources. There may be a range of budget levels and the selection of the appropriate level would be based on the risk acceptance level.

Access to Public Lands

Recreation

The Mt. Baker-Snoqualmie National Forest is one of the most visited recreation areas in the nation. Continued access to high value recreation opportunities and settings is forefront in the mission of the forest. With over seven million people in the Puget Sound area, many people depend on the road system to access eight Wilderness Areas, over fifty campgrounds or picnic areas, and approximately 1,500 miles of trail.

Road segments were rated against a wide variety of recreation criteria. Roads that provide access to developed sites or the trail system or are heavily used by the public are rated as the most important roads in this process. Roads are ranked using information from the recently completed [Recreational Facilities Analysis \(RFA\)](#), which identified the recreation infrastructure that could be sustained with the resources currently available. In the RFA analysis, all developed recreation sites were ranked in priority order from most important to least important. Sites were evaluated and ranked based on conformance to the forest niche and amount of recreation use (35%), financial efficiency (35%) and environmental and community sustainability. Initially roads accessing high value developed site were ranked as High, and those leading to low value sites were rated low. The Districts then reviewed the results of the ranking and made site-specific changes to the ranking based on local knowledge and concerns.

Vegetation Management

Managing vegetation most often relies on roads for access. Road access is needed to effectively apply silvicultural treatments to meet land management objectives in both Late-Successional Reserves (LSR) and Matrix land allocations, as well as in Management Area 8E. This analysis identifies those roads that access areas with opportunities to actively manage vegetation.

In LSR, current best science and recent management experience on the MBS indicates that stands respond effectively to treatment and can be treated most efficiently between the ages of 50 and 80 years. Roads that access LSR stands within that age range are the highest priority to retain for vegetation management access in LSR land management allocations. Stands between the ages of 20 and 50 years are expected to be in a suitable condition for effective silvicultural treatment within a mid-range planning horizon. Roads that access those stands are moderate priority for vegetation management access. Road segments that provide access to stands younger than 20 years of age are low priority.

Road access is needed in Matrix stands to provide for silvicultural treatments to meet a variety of resource management objectives and to contribute toward MBS timber harvest goals. Roads that access Matrix stands included in the MBS 5-Year Timber Sale Action Plan are needed in the short term and are considered high priority for vegetation management access. Roads that access Matrix stands that could be potentially treated in 5 to 20 years are needed in the mid-range planning horizon and are considered moderate priority for vegetation management access. Roads that access other Matrix stands not expected to be treated in the next 20 years are considered low priority for vegetation management access.

Cultural/Heritage

There is a need to identify specific road segments that contribute to the Forest's ability to address its inventory, nomination, protection, and preservation responsibilities for federally-owned historic properties. In a small number of cases, this management responsibility benefits from road access.

Highly valuable roads access identified priority sites and contributes to the Forest's ability to meet its protection, preservation, and public access responsibilities. Moderately valuable roads are important for the Forest to efficiently meet responsibilities to inventory, and evaluate the National Register eligibility of field-verified sites. A rating of Low indicates that access is desirable in the short term to inventory areas that have a high potential for sites (sites that are mapped in GIS, but have not been field verified). A "zero" rating indicates no known need for the purpose of administering the Forest's Heritage Program.

Special Uses

The forest is interested in understanding which roads are currently used by special use permit holders or mineral claimants to access permitted facilities, mining claims, or deliver their customers to recreational access points on the National Forest. The purpose of using an evaluation criteria for Special Uses is to differentiate permit holders' or claimants' access needs from our administrative staff needs and to identify where opportunities may exist for a permit holder(s) or claimant(s) to contribute or share towards maintaining the road(s) for access.

Special Uses administrators and the Forest geologist have collected and compiled information of the various permitted uses (permit holders and claimants) on the Forest. Roads used for access of permit holders' and claimants' operations and facilities are designated by the special use type, such as:

- Mineral claims (unpatented and patented)
- Recreation outfitter-guide services (river and terrestrial)
- Recreation residences
- Ski areas, resorts, organization camps
- Airstrips
- Hydroelectric facilities
- Power lines (high voltage transmission, lower voltage distribution)
- Telecommunication lines (telephone, fiber optic cables)
- Electronic sites (commercial wireless telecom, private and agency mobile radio service, microwave, environmental monitoring (weather, stream flow, sno-tel, geologic)
- Water lines
- Road maintenance stockpile sites

Forest Service Administrative Access

Forest Service administrative access needs will be tracked to ensure we retain sites that are necessary for the Forest Service to function, like routes to our repeater sites, etc. Table 3 shows the pertinent administrative designations that are expected to be tracked.

Table 3. Types of Forest Service Access that will be considered in the SRS process.

Administrative Designation	Types of access included
Office access	Access roads and parking for Ranger Stations, work centers, visitor information centers, residences, and other admin sites.
Recreation site	Access roads and parking for trailheads, viewpoints, boat ramps/launches, picnic sites, and hot springs.
Campground	Roads accessing campgrounds and the campground roads and parking
Parking lot	Parking lot
Pit access	Rock pit, rock quarry, pit access, pit roads
Airstrip	Airstrip roads and parking
Electronic Site	Radio repeaters and RAWs (weather stations)
Lookout	Lookout

Joint Ownership/Use

Existing rights-of-way could affect the forest's ability to change road maintenance levels. In other cases, the forest can determine the road maintenance level necessary for NFS land management purposes independent of needs for landowner access to private property. The MBS will identify and track road right-of-way status so that we can identify where changes to road maintenance levels would require additional discussions with cost share cooperators, permittees, easement holders, and landowners prior to making any changes. This information provides clear limitations on whether or not we can unilaterally change road maintenance levels, as well as providing an inventory of road authorizations that may allow the forest to collect funds or share in the cost of maintaining roads for access. Road segments will be identified by existing data on road right-of-way acquisitions and grants. The following table (Table 4) highlights general categories of rights-of-way, easements, and road authorizations that will be included in the Joint Ownership field in the infrastructure database (Infra). The Forest Service uses the Infra database to manage information on national resources, such as buildings, trails, roads, wilderness areas, and water systems.

Table 4. Types of Right of Way Access that will be considered in the SRS process.

Right of Way Type	Description
Cost Share Easements	Easements exchanged between cooperators and the Forest Service for a shared, jointly owned road system.
Forest Road Special Use Authorizations	Easements or permits granted to others to use roads that are part of the Forest Development Road (FDR) system.
Acquired Easements	Easements acquired by the Forest Service to cross non-National Forest System lands, such as private property.
Inholder Access	These roads access private property. The landowners do not currently hold a special use authorization.
Non Cost Share Easements	Easements granted to cooperators for roads that are not on the FDR system.
Private Road Special Use Authorizations	Easements or permits granted to others for roads that are not on the FDR system.
Other	Reserved, outstanding, or statutory rights held by others for roads on National Forest System lands.

Resource Risks

Aquatics (geology, soils, water, and fish)

Aquatics issues cover a broad spectrum from protection and restoration of endangered salmonid populations to maintenance of soil productivity and water quality. Forest roads can alter or modify water (flow) delivery and transport, as well as sediment / bedload delivery, transport, and deposition. Roads can alter aquatic organisms' habitat by affecting habitat access, for example, fish passage. Roads can also influence water quality indicators such as turbidity. The interconnectedness of soil, water and fishery resources all relate to meeting the intent of the Aquatic Conservation Strategy of the Forest Plan (USDA, USDI 1994).

Roads were assessed against nine aquatic resource risk factors based on existing data. Roads that pose the highest risk to aquatic resources are often the high priority candidate roads for drainage upgrades or road decommissioning or closure treatments, depending on access needs. Field-verified aquatic risk information were used as the primary data source.

Wildlife

The MBS is home to numerous wildlife species including four threatened and endangered species, thirteen Sensitive species, and other local species of concern or importance. Roads affect wildlife populations or individuals in numerous ways, from habitat loss and fragmentation, to barriers to animal movement, and wildlife mortality.

Road segments were ranked on their potential impacts to wildlife and their habitats, particularly potential impacts to grizzly bear habitat, areas used by mountain goats, and historical nest sites for Threatened and

Endangered species, including Northern Spotted Owls and Marbled Murrelets. Potential impacts to riparian species are indirectly considered in the aquatic assessment.

Botany/Invasive Plants

Roads serve as a primary vector for the introduction and spread of invasive plants. Roads with large infestations, high priority invasive plant species, and those species most difficult to control pose the greatest risk. Decommissioning of roads would limit the continued disturbance under which invasive plants thrive as well as stop the route of entry into new areas previously un-infested. Additionally, invasive plants can increase road maintenance and project costs by limiting access, compromising road integrity and safety, and requiring complicated contract specifications related to invasive plant prevention and treatment standards.

Based on current data and information we have of known invasive plant sites, roads were evaluated based on the level and type of invasive plant infestation to determine what roads would be considered highly infested and thus pose the greatest risk to other resources. Items included in evaluation were size and percent cover of infestation, proximity to sensitive/important botanical areas or other susceptible resources and consideration of the invasive plant species and its management concerns.

Cultural/Heritage Resource Concerns

Both desirable and undesirable effects may result from roads accessing cultural and heritage sites. For some sites, the interpretation opportunities may drive a need to maintain access to the site. For others, an over-riding desire to protect the site from physical damage or vandalism shifts the concern to one of limiting access. Road segments were analyzed using two different heritage criteria to capture these distinct issues.

The analysis identified where continued use and/or maintenance of the road may be impacting cultural sites located on roads or road prisms. This analysis also identified roads that provide access to cultural sites where vandalism has occurred and could be reduced through road closures. Roads were rated based on the access they provide to cultural sites that are either eligible for or currently listed on the National Register of Historic Places (NRHP). A high rating indicates access to sites eligible or listed on the NRHP and known sites that are unevaluated for NRHP eligibility. A rating of Medium indicates roads that create a moderate potential of risk, because a suspected site (mapped, but not field-verified, or when the boundaries of the site have not been delineated) may be impacted. A rating of Low indicates no known impact or risk of damage to a site caused by the continued use or maintenance of the road segment.

Economic Impacts to Communities

If maintenance budgets continue to decrease, there is a risk that road safety deficiencies will increase over time and roads may need to be closed to access. If these roads deteriorate over time, local communities and businesses that depend on these roads for access may suffer.

Public Engagement

The Forest conducted an extensive public engagement process as part of the development of the sustainable roads strategy. There were three components to the public engagement process. Public meetings were held in communities near the MBS national forest. An online questionnaire provided another opportunity for input. People provided comments on the blog-site or sent letters describing their views about the forest road system. A report in Appendix D summarizes information collected from community meetings and the online questionnaire (McLain et.al. 2014). The Sustainable Roads public engagement process had three primary goals:

- Inform people about the Sustainable Roads Strategy and the Travel Management Rule of 2005.
- Provide an opportunity for people to talk about their uses and priorities for forest roads.
- Generate spatial information about public uses and priorities to inform the Sustainable Roads Strategy.

A “Sustainable Roads Cadre” was developed to help craft this effort. The cadre represents a wide array of forest user groups ranging from environmental, hunting, hiking, off-road vehicles drivers to the timber industry. The Cadre helped to schedule and manage meetings and to lend their voices to the dialogue. An ongoing two-way dialogue process was developed by the Forest Service’s Pacific Northwest Research Station and Portland State University to understand how people use and value landscapes and resources as well as to identify areas of high impact or conflict.

At a series of nine meetings, the public was asked to tell the Forest what forest roads mattered most to them. An online questionnaire provided an additional opportunity for input. Members of the public also submitted comments via the Sustainable Roads blog-site describing their views about the forest road system. The data gathered was then shared with the community in a series of four public meetings. The data gathered by the public engagement process was then used to generate geospatial information about public uses and priorities to inform the sustainable roads strategy.

Continued public engagement has included a Forest Roads 101 field trip to highlight the primary aspects of forest road management. The Forest is currently developing an educational video on forest road management that will be posted to the Forest website for all users to view.

The Forest will share the Sustainable Roads Report in late 2015 with members of the cadre and the general public via the website, press releases and social media.

Tribal Engagement

Initially tribes were informed by letter, explaining the sustainable roads analysis process. From this initial scoping two tribes submitted comments to the forest, supporting a need for open roads that provide access for various tribal activities.

As part of continuing tribal engagement, another letter was sent to tribes on August 14, 2015 seeking input on the SRS methodology and draft report. Many tribes requested and were provided additional information on the SRS methodology and other draft data. Two tribes responded with specific comments on the SRS report. One tribe was concerned about maintaining access to traditional food gathering areas and the other recommending keeping as many open roads as possible to give Tribal members access to exercise their treaty-reserved rights. Specific tribal concerns received on the draft report will be addressed for each tribe. Each tribe will be contacted individually to address their specific needs and concerns.

Ongoing tribal engagement, along with government to government consultation, is anticipated when the forest begins future watershed/project level analysis. Government to government consultation would be completed, when requested, before the forest would implement any projects related to road closures and decommissioning. This will allow for further dialogue regarding concerns identified in the SRS process before any project implementation.

Rating and Rule-Sets

The risk and benefit assessment for each road segment was based on separate risk and benefit assessments completed by specialists on the IDT. Each road segment generated a high, medium, or low rating for risks and benefits based on the criteria stated in the previous section. For access needs or benefits, rule-sets

were developed in the form of “if-then statements” to translate the ratings into the minimum access needs (Appendix A). Final decisions on the disposition of roads are site-specific and will require the appropriate level of NEPA analysis. A complete list of the roads, overall rankings, and the specific opportunities are located in Appendix A. Table 5 and 6 summarize the miles of road for ratings of access needs and risks by resource.

Table 5. Summary of Ratings for Access Needs for Mt. Baker-Snoqualmie National Forest Roads.

Rating	Recreation Access Need (Miles)	Vegetation Management Access Need LSR (Miles)	Vegetation Management Access Need MATRIX (Miles)	Vegetation Management Access Need MA-8E (Miles)	Cultural Resource Access Need (Miles)	Special Use Access Need ALL (Miles)	Special Use Access Need PERMIT (Miles)	Administrative Access Need (Miles)
High	328	1327	592	39	54	1234	433	133
Medium	296	273	207	0	354	--	--	--
Low	283	757	1558	2317	1938	--	--	--
Unrated	1450	0	0	1	11	1123	1924	2224

Table 6. Summary of Ratings for Resource Risks for Mt. Baker-Snoqualmie National Forest Roads.

Rating	Aquatic Risk (Miles)	Wildlife Risk (Miles)	Botany/Invasive Plant Risk (Miles)	Cultural Risk (Miles)
High	999	466	284	216
Medium	492	1260	410	339
Low	864	619	195	1791
Unrated	2	12	1468	11

The minimum access needs or proposed maintenance levels were based on rule sets developed for access for recreation, fire, cultural, and vegetation management. These rule sets are described in more detail below. Risks were considered, but it was determined that effects or impacts to other resources could be mitigated by other means than changing maintenance levels to close or decommission a road. A restoration strategy needs to be developed to determine the roads that will be needed for access for restoration actions.

Recreation

For management purposes, all High and Moderate rated roads would be managed for passenger cars and would be maintained at a minimum of Maintenance Level 3, while the Low rated roads would be managed for high clearance vehicles and maintained at minimum of Maintenance Level 2.

If further reduction of the system is needed, some of those roads classified as Moderate for recreation could be changed to maintenance level 2 on a site by site basis to reduce costs or to meet other resource objectives. The roads left unrated would have the lowest need for vehicle access to recreation opportunities.

Fire

The need to maintain service access to five Remote Automated Weather Stations (RAWS) and numerous communication equipment sites (radio repeaters, etc.) was identified. Anything that has a Fire rating would be maintained to a minimum of a Maintenance Level 2.

Cultural

The table below uses an “If-Then” statement to recommend what the Final Access Categories & Maintenance Levels should be based on identified Cultural Risk and Cultural Access Needs. Where the Cultural Risk or Cultural Access need combination differs from these, the road segment should be assessed on a case-by-case basis (Table 7). Where decommissioning is a high risk to cultural sites, closing the road is preferred to decommissioning to reduce potential impacts from activities that cause ground disturbance.

Table 7. Priority for Access to Cultural Sites.

If the CR or CA is [] then from the perspective of Heritage Resources the FAC should be []

Cultural Risk of road (CR)	Cultural Access of road (CA)	Proposed Treatments	Final Access Categories (FAC) (using RO terminology)	Maintenance Levels
L	H	Maintenance. Possible Treatments.	Routes that are needed for existing annual, year-round or seasonal motor vehicle use	3 - 5
L	M	Maintenance. Possible Treatments	Routes that are needed for existing annual, year-round or seasonal motor vehicle use	2 - 5
H	M	Allow to be brush-closed. Possible Storage treatments	Routes that are needed for long-term resource management purposes, but are suited for intermittent project use.	1
H	L			
M	M			
M	L			
L	L	Decommission. Treatments.	Routes with minimal or no identified future motorized access needs.	0

Vegetation Management

Purpose of road access for Vegetation Management

Vegetation management through silvicultural activities is an important means of accomplishing Forest goals and objectives. The Forest uses silvicultural activities to accomplish wildlife habitat objectives, including late successional habitat, elk forage, and riparian habitat treatments and to attain timber harvest goals. Silvicultural activities are commonly accomplished through timber sale and stewardship contracts, which require road access for equipment and vehicle access.

Short term and long term road access needs differ by management area allocations. Three separate management allocation categories are relevant to the road maintenance decisions to be made:

Late successional reserves (LSR) are allocations designed to serve as habitat for late-successional and old-growth related species including the northern spotted owl (USDA and USDI, 1994). In general, treatments may occur in LSR stands up until age 80 years for the purpose of creating or maintaining late-successional forest conditions. Silvicultural treatments are generally not appropriate after age 80. Therefore, roads will normally not be needed for silvicultural treatments if they do not provide access to stands younger than 80 years.

Matrix stands are those where most timber harvest and other silvicultural activities are expected occur. Silvicultural treatments are expected to occur periodically over the long term and road access will be required more or less permanently in Matrix allocations to accomplish the treatments.

Management Area 8E, Greenwater Special Area (MA 8E) is an allocation emphasizing the creation and maintenance of elk forage habitat (USDA, 2001). Roads are generally needed to access a single treatment entry. Subsequent access may be needed to maintain forage units.

Vegetation Management Access Rating Criteria

Process used to assign ratings

Each road was assigned a rating of High, Medium, or Low through a two-step process. In the first step, each road was assigned a rating using a proximity analysis using GIS. The initial rating given a road was based on the ages of stands within 100 feet of the road as shown in Table 8. In most cases, roads are adjacent to stands of multiple ages. Therefore, the rating for the road was based on the adjacent stand that indicates the highest rating. For example, if a road is adjacent to Matrix stands of less than 40 years and stands of 41 to 120 years, the rating for the road would be “High” since that is the higher rating.

Table 8. Priority rating based on proximity to stands

Management Allocation	Adjacent Stand Description	Rating
Matrix	Greater than 40 years and less or equal to 120 years	High
	Less than 40 years	Medium
	Greater than 120 years	Low
LSR and MA 8E	Greater than 40 years and less than or equal to 80 years	High
	Less than 40 years	Medium
	Greater than 80 years	Low

Following the initial rating, roads were assessed at a broad scale to identify factors not calculated in the initial GIS based assessment. Factors identified included:

- Roads not in proximity to high or medium priority stands but that were needed to access those stands. For example, roads on the haul route between the stands rated as high or medium priority and the major highway. In this situation, the road would be given the same priority as the highest priority road further up the haul route.
- Roads that provide access to stands rated as high or medium based on stand age, but that are isolated with a relatively low likelihood of silvicultural treatment in the foreseeable future. In this situation, the road priority rating was reduced to either “Medium” or “Low” depending on a subjective assessment of the probability of treatment.
- Roads that provide access to high or medium priority rated stands that are more than 100 feet from those stands. In this case, the road might be needed to reach a helicopter landing or a temporary road start point to reach a stand more than 100 feet away. Roads in this category were assigned a rating based on the same age categories displayed in Table 1.

In the second step of the rating process, district wildlife biologists, environmental coordinators, and vegetation management staff were involved in reviewing and assigning ratings. Road access priorities for Management Area 8E were assigned based on the review and advice of the South Zone Wildlife Biologist since the access needs are entirely related to creating and maintaining elk forage habitat.

Timeframe of road access needs for Vegetation Management

Timber sale and stewardship contracts used to accomplish vegetation management goals typically last for about 3 to 5 years. After a contract is completed, the roads used might not be needed again until 10 to 30 years later. Some roads, particularly in LSR and MA 8E, might not be needed at all after the initial treatment entry. During the life of the timber sale or stewardship contract, the purchaser or contractor will complete road maintenance activities commensurate with the level of their operations. During periods of use, the minimum maintenance level will generally be ML 2. In periods of non-use, i.e., if no further use is anticipated for the next decade, the minimum maintenance level for vegetation management will generally be ML 1.

Vegetation Management considerations for road maintenance decisions

The management allocation for a given area will affect the decision regarding road management and road maintenance. Considerations for road maintenance decisions are included for both the short-term and the long-term (Table 9).

Table 9. Management consideration for the vegetation management access

Allocation	Vegetation Management Access Need During Periods of Non-Use		
	<i>Low</i>	<i>Medium</i>	<i>High</i>
Matrix	ML 1 or decommission	ML 1	ML 1
LSR	ML 1 or decommission	ML 1	ML 1

Matrix

- Roads that access young stands in Matrix land allocations will likely be needed over the long term for vegetation management activities, although the use might be intermittent. If a road is needed for reasons other than vegetation management, for example, high use recreation or administrative access, the access need for the other resource will likely dictate the long term need for the road.

- If the road is not needed over the long term for other uses, consider placing the road in storage (ML1) during periods of non-use by timber sale or stewardship contracts. Short term access needs should be evaluated before placing road in storage. Roads will be opened and maintained by the timber sale or stewardship contract at the standard appropriate for the management activity.

Distribution of Risk and Benefit Assessment

Risk and Benefit for Roads (ML1 to ML 5)

Of the 2,440 miles of roads that constitute existing National Forest System roads (ML1 – ML5) on the Mt. Baker-Snoqualmie National Forest, approximately 1,018 miles or 42 percent of the roads rated as a medium or high benefit, meaning that these roads have several purposes that are important to Forest Service management or public use. Of those roads that ranked as medium or high benefit, 729 miles or 72 percent of those roads were also a high risk due to resource concerns. These high risk/medium benefit and high risk/high benefit roads should be the focus of road maintenance funds because mitigating their adverse effects will be the most efficient way to lower the impact of the forest transportation system on the surrounding natural and cultural resources.

Miles of road in Risk and Benefit ratings are displayed in Tables 10 and 11 by existing operational maintenance level.

Table 10. Road Miles Risk Rating by Existing Operational Maintenance Level.

Operational Maintenance	Criteria Rating	SRS-GIS Percentage Based Miles of Road			
		Wildlife Risk	Invasive Risk	Cultural Risk	Aquatic Risk
Level 5	High	9.7	29.3	9.8	16.1
	Med	18.1	13.1	10.4	15.2
	Low	18.3	1.7	26.0	14.9
	Unrated	0.0	2.0	0.0	0.0
Level 4	High	9.8	25.4	33.6	46.3
	Med	54.6	20.6	15.9	2.8
	Low	6.9	18.8	21.7	22.2
	Unrated	0.0	6.4	0.0	0.0
Level 3	High	174.7	180.6	116.3	454.9
	Med	481.0	189.3	169.0	216.7
	Low	262.8	87.2	633.2	247.0
	Unrated	0.0	461.4	0.0	0.0
Level 2	High	178.1	40.9	27.6	258.9
	Med	354.8	142.1	87.6	173.2
	Low	208.5	50.1	626.2	309.2
	Unrated	0.9	509.2	0.9	0.9
Level 1	High	99.5	3.7	21.9	220.4
	Med	349.5	43.7	58.6	67.8
	Low	101.5	40.5	470.0	260.9
	Unrated	0.0	462.6	0.0	1.3
None Listed	High	0.0	0.3	0.7	0.8
	Med	0.6	0.4	0.0	4.7
	Low	9.0	0.0	8.9	4.1

	Unrated	0.0	9.0	0.0	
--	---------	-----	-----	-----	--

Table 11. Road Miles Benefit Rating by Existing Operational Maintenance Level.

Operational Maintenance	Criteria Rating	SRS-GIS Percentage Based Miles of Road					
		Recreation Benefit	Cultural Benefit	Veg LSR Benefit	Veg Matrix Benefit	Veg Mg8E Benefit	Fire Benefit
Level 5	High	35.5	9.8	39.4	15.8	10.2	15.3
	Med	3.8	12.2	0.5	9.7	0.0	--
	Low	6.3	24.2	6.3	20.7	36.0	0.0
	Unrated	0.7	0.0	0.0	0.0	0.0	30.9
Level 4	High	59.0	13.1	54.2	23.5	0.0	15.7
	Med	9.9	36.4	0.8	0.9	0.0	--
	Low	0.8	21.8	16.3	47.0	71.3	0.0
	Unrated	1.7	0.0	0.0	0.0	0.0	55.6
Level 3	High	199.9	26.3	591.9	250.2	19.6	58.7
	Med	249.5	212.0	60.9	70.9	0.0	--
	Low	170.5	680.2	265.7	597.3	899.0	9.1
	Unrated	298.6	0.0	0.0	0.0	0.0	850.7
Level 2	High	31.1	0.8	349.0	164.0	9.1	25.1
	Med	30.5	64.4	127.1	77.1	0.2	--
	Low	95.2	676.1	265.2	500.2	732.0	0.0
	Unrated	585.3	0.9	0.9	0.9	0.9	717.2
Level 1	High	2.5	0.9	295.2	136.8	0.5	1.3
	Med	2.5	27.6	76.1	43.8	0.0	--
	Low	6.3	522.0	179.2	369.9	549.9	0.0
	Unrated	539.1	0.0	0.0	0.0	0.0	549.1
None Listed	High	0.3	0.3	3.6	4.8	0.0	0.0

	Med	0.1	0.4	0.5	0.4	0.0	--
	Low	1.1	8.9	5.5	4.4	9.6	0.0
	Unrated	8.1	0.0	0.0	0.0	0.0	9.6

Step 5: Describing Opportunities and Priorities

Purpose

The purpose of this step is to:




- Identify management opportunities and priorities and formulate proposals for changes to the forest transportation system that respond to the issues, risks, and benefits identified previously in the analysis.
- Compare existing motor vehicle use with desired conditions, and describe options for modifying the forest transportation system that would achieve desired conditions.
- Develop guidelines for mitigating road risks.

Opportunities for Roads

Management opportunities for roads were identified through the risk/benefit rating evaluation for each resource in Step 4 of the analysis. A complete list of the roads, overall rankings and the specific recommendation are located in Appendix A. Final decisions on the disposition of roads are site-specific and require the appropriate level of NEPA analysis.

Guidelines for Mitigating Road Risks

The general guidelines for mitigating the risks discussed in previous sections of this report are listed below. These guidelines should be used for existing roads or when a road needs to be relocated due to unacceptable resource risks.

		Identified Access Benefit		
		High	Moderate	Low
Ecological Risk Assessment	High	Annual Maintenance & Invest to mitigate risk	Intermittent Maintenance & Invest to mitigate risk &/or Close Stabilize	Decommission
	Moderate			
	Low	Minimal maintenance & Minimal investment	Minimal maintenance & Minimal investment	No imminent investment

Low Benefit Roads

Roads that have a Low Benefit with no compelling administrative or public in the long-term should be considered for decommissioning or conversion to other uses such as trails. If there is a future need for the road but no immediate need, then it should remain on the system as a closed (ML1) road. Closed roads are closed for at least a year and are most effectively managed for short-term uses. Risk associated with these routes indicates investment of time and funds to mitigate risk. High Risk roads would generally receive higher priority than Medium and Low Risk. Drainage features should be inspected before each closure to prevent resource impacts.

Medium Benefit Roads

Roads that have Medium Benefit should remain open for administrative use or open for the general public, depending on which type of access is appropriate to meet resource management objectives. The risk associated with these routes indicates investment of time and funds to mitigate risk. High Risk roads would generally receive higher priority than Medium and Low Risk. Maintenance of drainage features and preventing erosion are the highest priority issues for these roads. Mitigation depends upon the specific risks and may include, but is not limited to: additional maintenance, reconstruction, relocation, and seasonal road closure. The scale and frequency of these activities will depend on the severity of the risk and the availability of funds.

For roads in this category that are important for public access, the Forest Service should work with cooperating agencies, user groups, or other entities to provide adequate maintenance, where appropriate.

High Benefit Roads

Roads that have High Benefit should remain open for administrative use or open for the general public, depending on which type of access is appropriate to meet resource management objectives. The risk associated with these routes indicates a priority for investment of time and funds to mitigate risk. High Risk roads would generally receive higher priority than Medium and Low Risk. Maintenance of drainage features and preventing erosion are the highest priority issues for these roads. Mitigation depends upon the specific risks and may include, but is not limited to: additional maintenance, reconstruction, relocation, and seasonal road closure. The scale and frequency of these activities will depend on the severity of the risk and the availability of funds.

For roads in this category that are important for public access, the Forest Service should work with cooperating agencies, user groups, or other entities to provide adequate maintenance, where appropriate.

Actions that Respond to the Issues

The following section describes strategies that the Forest may choose to employ in projects and situations where the issues occur (see Step 3). The scale at which these actions may be implemented is dependent on the site and the compatibility of the action with the overall management focus of the surrounding area. The list below is intended to provide options that project leaders and decision-makers may consider when implementing changes to the road system.

Issue 1: Access to recreational sites or opportunities

Action: Maintain access to recreation sites that are provided by the Forest Service for public use as much as possible with a priority for High and Moderate ranked roads.

Action: Annually maintain and update the Motor Vehicle Use Map.

Action: Maintain road signage in accordance with handbook direction.

Issue 2: Access to timber sales or vegetation management areas

Action: Focus maintenance funds on the high priority roads identified in Step 4 of the analysis to provide long-term service on the roads that are needed the most.

Action: During the NEPA process for management activities use this report to identify and consider closing (ML1) other open roads in the project area after the management activities are completed, thereby realizing reduced maintenance costs.

Action: Maintain and update the Motor Vehicle Use Map if roads are closed to administrative use only.

Issue 3: Legal commitment to others (e.g. easements, special use permits, cost share agreements, road maintenance agreements, private in-holder, mine access, etc.)

Action: Where advantageous to the government, maximize cooperation from landowners by proposing to issue a reciprocal easement.

Action: Transfer road jurisdiction to the county when the road is a good choice for transfer and there is agreement from the county.

Action: Where there exists single private/personal use roads or road segments, enter into a special use agreement with the landowner or permittee, stipulating that the permittee has maintenance responsibilities.

Issue 4: Access for tribes

Action: After consultation with tribal leaders, identify roads that can be gated to control access. Access may be managed under permits rather than a publicly open road.

Action: Open up negotiations with tribes in regards to maintenance responsibilities.

Issue 5: Access to administrative sites (e.g. weather stations and radio repeater sites) or other management areas.

Action: Maintain access to Forest Service administrative sites.

Issue 6: Roads have effects on Aquatic Conditions.

Action: Implement the guidelines for mitigating road risks to reduce soil and drainage impacts from roads. This may include replacing, improving and maintaining the drainage structures and elements of the roads.

Action: Provide information and education about motor vehicle regulations and responsible use of motorized vehicles on the National Forest. Install information boards at area trailheads, recreation sites, and parking areas.

Action: Install route numbers on all system roads at junctions with system and unauthorized routes to assist users with compliance of motor vehicle use regulations, as funding allows.

Action: Educate the public to create an understanding of the problems created by driving on closed or unauthorized roads. Implement an ongoing effort to educate forest users of the motorized travel policy.

Action: Utilize enforcement to curtail driving on closed or unauthorized roads. Implement patrols and field presence at appropriate times of year (such as hunting season, holidays, weekends, etc.) in identified areas. This effort is also used to educate users of the travel policy.

Action: Rehabilitate areas damaged by driving on closed or unauthorized roads.

Issue 7: Roads have effects on Wildlife Habitat

Action: Reduce the number of roads located in habitat for species-of-concern and species-of-interest.

Action: Place seasonal restrictions on roads going through sensitive habitat.

Action: Reduce the road width and maintenance level to minimum needed for safe vehicle passage and to meet the intended need in sensitive wildlife areas.

Issue 8: Protection of heritage or cultural sites

Action: Reroute existing roads that impact important heritage sites.

Issue 9: Economic impacts to communities

Action: At the district or appropriate scale, consider whether the roads meet current public access needs.

Issue 10: Financial sustainability

Action: Focus available maintenance funding and resources on the highest priority roads identified in the SRS report, (address issues related to user safety first, then on repair/prevention of resource issues)

Action: Focus any available capital funds toward improvement work on high use roads with high environmental risks identified in the SRS report

Action: Prioritize funding for roads to be closed or decommissioned based on those with the highest environmental risks identified in the SRS report

Action: Ensure that timber sale purchasers or commercial users perform, or deposit funds, for road maintenance work commensurate with their use

Action: Seek additional funding for road maintenance through regular appropriations

Action: Seek new and additional funding sources for road maintenance and improvements through any available funding programs such as Capital Investment Programs, Legacy Roads and Trails, Forest Highway Programs, etc.

Action: Seek partnership, cooperator, and volunteer opportunities to help leverage funds with outside sources

Action: Seek opportunities to transfer jurisdiction of FS roads to other agencies

Action: Continue to look for ways to reduce maintenance costs, and overhead costs related to Forest Service road programs, so as to direct more funds directly to road maintenance and improvement work

Step 6: Reporting

Purpose

The purpose of this step is to report the key findings of the analysis.

Desired Condition of the Future Road System

Travel Management Rule, 36 CFR 212.5 (b) states:

“...b) Road system--(1) Identification of road system. For each national forest, national grassland, experimental forest, and any other units of the National Forest System (Sec. 212.1), the responsible Official must identify the minimum road system (MRS) needed for safe and efficient travel and for administration, utilization, and protection of National Forest System lands. In determining the minimum road system, the responsible official must incorporate a science-based travel analysis at the appropriate scale and, to the degree practicable, involve a broad spectrum of interested and affected citizens, other state and federal agencies, and tribal governments. The minimum system is the road system determined to be needed to meet resource and other management objectives adopted in the relevant land and resource management plan (36 CFR part 219), to meet applicable statutory and regulatory requirements, to reflect long-term funding expectations, to ensure that the identified system minimizes adverse environmental impacts associated with road construction, reconstruction, decommissioning, and maintenance.”

Key Findings of the Analysis

This report documents the science-based travel analysis which is a key first step towards identifying a minimum road system per the regulations cited above. The results of this sustainable roads analysis will be used by the responsible official for identification of the forest's minimum road system following appropriate NEPA analysis. The ID team has identified a variety of opportunities for making changes to current road management practices that would meet the direction in 36 CFR 212.5 (b). The opportunities for change summarized in this report are the ID teams' recommendations based on the risk/benefit analysis and road maintenance cost considerations. Prior to any travel management decisions being made, including any roads being added or deleted from the system, site-specific analysis, including public involvement, would be completed through the NEPA process at an appropriate scale.

Through the sustainable roads analysis process, the IDT does not recommend constructing additional system roads. The IDT ranked routes based on their risks to natural and cultural resources and their benefits to access. The IDT identified opportunities where about 32 percent (783 miles) of NFS roads analyzed could be decommissioned or closed, and the remaining miles of the current road system could be mitigated by reducing road maintenance levels or doing road upgrades to reduce resource risk. Based on the analysis in Step 4, the IDT took a more detailed look at the Low Benefit/Medium and High Risk road segments. Of these road segments, the team felt that 177 miles could be decommissioned and removed from the system (Appendix H). The map in Appendix F shows opportunities for moving the MBS road system to a more sustainable state. A complete list of the individual rankings of each criterion for each road can be found in Appendix A.

A final consideration in developing the SRS is road maintenance cost. Based on funding levels over the previous five years, the Mt. Baker-Snoqualmie National Forest can only afford to maintain approximately 35% of the current road system fully to standard. This trend is continuing, and by default, annual

prioritizing for maintenance has been occurring resulting in roads that do not meet Highway Safety standards and are at risk for failures. The outcomes of this analysis will serve as a basis for long-term maintenance cost reductions, prioritizing the scarce resources to maintaining the desired forest transportation system that meets the access needs for the public or for administrative purposes.

The Financial Analysis in Appendix G includes a scenario using the total mileages from the opportunity categories listed above to examine the potential reduction in maintenance costs if these changes were to be made. A quick summary of what the changes would look like are shown in Table 12.

Table 12. Potential changes to road system based on Financial Analysis Scenario

Category	Road Miles		
	<i>Before</i>	<i>After</i>	<i>Diff</i>
Roads Maintained for Passenger Cars (ML 3-5)	1032	498	-534
Roads Maintained for High Clearance Vehicles only (ML2)	769	521	-248
Overall Open Road System (ML 2-5)	1801	1018	-783
Closed Intermittent Service Project Roads (ML1)	639	1242	603
Overall size of transportation system (open and closed roads)	2440	2263	177
Roads to be further considered for Decommissioning	0	177	177

This would result in a road system that is 177 miles smaller, overall, than the existing road system. The amount of roads maintained for passenger car traffic would be reduced by 534 miles. The amount of roads maintained for high clearance vehicles would be reduced by 249 miles. Approximately 1,245 miles of project roads used intermittently (ML 1), would remain on the official transportation system. The remaining 177 miles are not likely needed for future use and would be further considered for decommissioning or conversion to other uses such as trails.

The results of this scenario show that the overall maintenance needs for the forest could be reduced by nearly \$900,000 per year by making these types of changes to road management on the Forest. However, this reduction still doesn't quite bring the average annual maintenance needs in balance with the average annual maintenance funding expectations. In order to meet the R6 guidelines for reflecting long-term funding expectations, approximately \$400,000 in additional annual maintenance costs would have to be reduced. This could be done by further reductions to maintenance standards and frequency of work on the remaining roads in the scenario above, primarily by further reducing the amount of roads maintained for low clearance passenger cars, and by putting additional ML 2 roads in storage between uses. However, these additional reductions would be increasingly difficult to make and opportunities for them will be further examined on a site specific project scale.

The results of the Financial Analysis show that the opportunities identified from the risk/benefit section of the MBS Travel Analysis Report are moving to be in line with the R6 guidelines for identifying a future system of roads where "average annual funding" is reasonably in balance with the "average annual cost of routine road maintenance".

This balance addresses routine annual maintenance work needed to keep roads open and safe for use, and addresses critical resource concerns such as maintaining ditches and culverts for proper drainage. In addition to the costs of maintaining the road system to these minimum standards, there are also costs associated with any proposed road decommissioning, road closures, and road improvements necessary to address risks and environmental concerns that are identified in the report. These costs are not included in the balancing of road maintenance funds because funding for these activities is not appropriated along with the normal road maintenance funds used in the calculations. Funding for this type of work generally

comes though other programs such as capital investment programs, Legacy Roads and Trails funding, Federal Highway programs, partnerships with outside groups and agencies, etc. Table 13 estimates costs to implement some of the opportunities described above.

Table 13. Estimate decommissioning and storage work costs

Category	Miles	Cost / Mile	Total Cost
Estimated Cost to decommission roads	177	\$39,000	\$6,903,000
Estimated Cost to place roads in storage	603	\$12,000	\$7,236,000
Total			\$14,139,000

In the example above, the cost to decommission 177 miles of road would be about \$6.9 million and the cost to complete the road storage would be about \$7.2 million. The total for all such work is estimated at \$14.2 million. MBS decommissioning costs span a range from a low of \$8,700/mile on up to \$144,650 per mile with an average of \$39,000 from 2008 to 2014. MBS storage costs span from a low of \$7,750 per mile on up to \$16,000 per mile with an average of \$12,000 from 2008 to 2014.

Given the current trend in reduced funding for road maintenance work, and the enormous gap between current funding and need, it does not appear possible to identify a future road system where the entire cost of annual maintenance work necessary to fully maintain the roads to standard would be in balance with available funding, (i.e., to include annual maintenance items and cyclic capital costs for replacement of gravel surfacing, pavements, structures, bridges, etc.). In the Pacific Northwest Region, the size of road system to meet that requirement would be less than 200 miles per National Forest and would not allow forests to meet resource management objectives in their Forest Plans or to meet statutory and regulatory requirements. Because we will not have enough funding available to keep all road surfacing materials and structures replaced on schedule, we can expect the deferred maintenance backlog to continue to grow, and we will continue to see a decline in the overall serviceability of our road system.

However, even though we can't alter the road system so much as to be fully affordable and sustainable within today's budget levels, we can certainly take steps to move it in better direction. By utilizing the opportunities identified from the MBS Travel Analysis Process, we can certainly move the MBS road system to a much more affordable and sustainable state.

Literature Cited

McLain, R. et. al. 2013. An Analysis of the Spatial Data from the 2013 Sustainable Roads Workshops. Portland State Department of Geography. Portland, OR.

USDA Forest Service. 1999. Roads Analysis: Informing decisions about managing the National Forest Transportation System. Misc. Rep. FS-643. Washington, D.C. : U.S. Dept. of Agriculture Forest Service. 222 pp.

USDA Forest Service. 2009. Forest Service Manual 7700 – Transportation System. Chapter 7700 – Zero Code and Chapter 7710 – Engineering Management.

USDA Forest Service. 2013. Deputy Forest Supervisor Charter Letter to Interdisciplinary Team and Forest Leadership Team.